Project 02
Treasure Island

1. The boardgame

"*Long John Silver's crew has committed mutiny and has him cornered and tied up! Round after round, they question him about the location of his treasure and explore the island following his directions — or perhaps his misdirections? Who knows... The old sea dog is surely planning an escape, after all, after which he will definitely try to get his treasure back.*

Treasure Island is a game of bluffing and adventure in which one player embodies Long John, trying to mislead the others in their search for his treasure. The hunt reaches its climax with Long John's escape, when he will make a final run to get the booty for himself!!" (boardgamegeek.com)

Source: [Treasure Island | Image | BoardGameGeek]

2. Project description

Project 2 is a simplification of the original boardgame. In this section I will introduce this simplified version's rule.

- **Game rule:**
  - **The map:**

    A sample of the map displays in Appendix 1.
    Item on the map:
    - The map is divided into multi-regions
    - Tiles contain labels:
      - A tile with label ***r*** (***r*** is an integer) is belong to ***r***-th region.
        - ***r*** = 0 is sea.
      - A tile with label "**M"** is a part of a mountain.
      - A tile with label **"P"** is a prison.
      - A tile with label **"T"** is the treasure position.
  - **The agent:**
    - Initial stage: spawn at a random tile EXCEPT sea (**"0"** tile), prison (tile with label **"P"**) and mountain (tile with label **"M"**)
    - Each turn:
      - The agent has 2 action each turn, the available action:
        - Verification, verify a hint is a truth or a liar.
        - Move straight 1-2 steps in a direction then perform a small scan.
        - Move straight 3-4 steps in a direction.
        - Stay and perform a large scan.
      - ONCE per game: the agent can teleport (instantly move to a tile anywhere on the map EXCEPT tiles with label **"0"**, and **"M"**).
      - The agent can not move to tile with label **"0"** and **"M".**
      - If the agent scans an area containing the treasure, the agent wins the game. -> ***WIN.***
  - **The pirate:**
    - At the beginning of the game, the pirate gives the agent a hint about the treasure, the first hint is always true.
    - At the beginning of each turn, the pirate gives the agent a hint about the treasure, the hint requires verification to make sure it is real!
    - After 2-4 turns, the pirate reveals the prison that he is staying in. (The prison is randomly selected).
    - After ***n*** turns (based on the map size), the pirate is free from the prison and moves directly to the treasure (shortest path). The speed of the pirate is upto 2 tiles each turn. If the pirate reaches the treasure tile, the agent loses the game. -> ***LOSE***

- **The pirate's hints:**
  1. A list of random tiles that doesn't contain the treasure (1 to 12).
  2. 2-5 regions that 1 of them has the treasure.
  3. 1-3 regions that do not contain the treasure.
  4. A large rectangle area that has the treasure.
  5. A small rectangle area that doesn't has the treasure.
  6. He tells you that you are the nearest person to the treasure (between you and the prison he is staying).
  7. A column and/or a row that contain the treasure (rare).
  8. A column and/or a row that do not contain the treasure.
  9. 2 regions that the treasure is somewhere in their boundary.
  10. The treasure is somewhere in a boundary of 2 regions.
  11. The treasure is somewhere in an area bounded by 2-3 tiles from sea.
  12. A half of the map without treasure (rare).
  13. From the center of the map/from the prison that he's staying, he tells you a direction that has the treasure (W, E, N, S or SE, SW, NE, NW) (The shape of area when the hints are either W, E, N or S is triangle).
  14. 2 squares that are different in size, the small one is placed inside the bigger one, the treasure is somewhere inside the gap between 2 squares. (rare)
  15. The treasure is in a region that has mountain.
  16. You can define your own hints.

  Please view Appendix 2 for hints' visualization.

3. Requirements

Your task in this project:

- Understand and implement the game rule.
- Implement a logical agent to walk around the map and scan for the treasure before the pirate is free and get it back. You don't have to win the game, try your best to think about how you can make the agent decides what to do with information on the map, on the hints, on the movement of the pirate when he is trying to reach the treasure.
- Build a visualization tool to draw the action of the agent step-by-step.
- Source code: please write a read.me to tell me how to run your code. There are only 2 languages you can use to implement the logical part of the project: C++ and Python. However, you can use any languages, tools to build visualizer for your project, I encourage you to make your visualizer as beautiful as it can be, but CLI, console, terminal, etc is still ok.

4. Input and Output

Input data is stored in the file $MAP_x.txt$, where x is the id of test case. The structure of the input file includes:

- The first line contains 2 numbers to represent the size of the map ($\boldsymbol{W}$ and $\boldsymbol{H}$).
- The second line is the turn number that the pirate reveals the prison ($\boldsymbol{r}$).
- The third line is the turn number that the pirate is free and start running to the treasure. ($\boldsymbol{f}$).
- The fourth line is the number of regions on the map (including the sea) ($\boldsymbol{R}$).
- The fifth line contains 2 numbers to represent the treasure position ($\boldsymbol{Tx}$, $\boldsymbol{Ty}$)
- The next ***H*** lines are the ***H*** rows of a map. Each row contains ***W*** columns that is separated using ";" character. Each cell represents a tile, the format for a cell is ***<spaces><region><tile_type>***, where $0 \leq$ ***<region>*** $<$ $\boldsymbol{R}$ and ***<tile_type>*** = *"M" or "P" if* ***<region>*** $\neq 0$. For example: 0", "4", " 4", " 5", "4P", " 4M".

For example:

```
5 5
2
4
4
1 1
0;   0;   0;  0; 0
0;   1;1 M;1P; 1
0;1P; 2M;   2; 2
0;   3; 3M;  3; 3
0;   0;   0;   0; 0
```

Output data is stored in the file $LOG_x.txt$, where x is the sequence number of the test cases. The structure of the output file includes:

- The first line is the number of lines.
- The second line is WIN or LOSE
- The number of turns take to end the game
- The following lines are the log. Feels free to write the log in any format that you feel easiest for generating the visualization. However, make should you write a description about your format. The information each turn I need you to provide:
    - The turn sequence number.
    - Agent:
        - Normal action every turn:
            - Verification

        - Move
        - Scan
    - Special action: teleport
- Pirate action:
    - Giving hint
    - Reveal
    - Reach the treasure after is free

The output for the above example is:

100 WIN <100 lines of logs>

5. Report

The report must also give the following information:

- Your detailed information (Student Id, Full Name)
- Self-assessment for completion level for each requirement.
- Your work (algorithms' description, pseudo code, explanation, visualization, test cases, evaluation, comments, conclusions):
    - Please tell me the number of hints you successfully implement.
    - Comment note:
        - Anything you want to share about your implementation. If you believe that your code contains anything special just show it to me. Your code is clean? Have you use some technique?
        - Why do you think your solution is good enough? Show me your thought, your strategy if you play the game, why do you design the agent like that.
- References (if any)

6. Assessment

No.	Criteria	Scores
1	Create 5 maps: - 3 maps with sizes: 16x16, 32x32, 64x64 - 2 maps larger than 64x64	10%
1.1	Implement a map generator	10% (bonus)
2	Implement the game rule	20%
3	Implement the logical agent	20%
4	Implement the visualization tools	15%
5	The agent can handle a complex map with large size, many of regions, prison, mountains	5%
7	Report your implementation with some reflection or comments.	20%
8	Contest*	10%
Total		100%

7. Notices

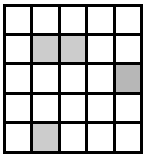
- The project is a **GROUP** assignment.
- Submission link and the deadline are set on Moodle.
- * The contest, after every group submit the project, I will pick 1 map and send them to all group. You need to run your code using this map as input. Then submit the result for me with full visualization and logs. You will get 5% if you have submitted valid the result.
- A step-by-step visualization of a run in the game: https://docs.google.com/presentation/d/1H6xoNW3sE7DZGWbpS1HMtm85vxnU07uyDNqcNqIhC48
- Any plagiarism, any tricks, or any lie will have a 0 point for the COURSE grade.
- Please read the following pages for a sample map and the pirate's hints visualizations.

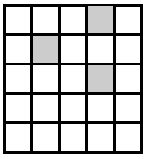
8. Appendix 1: Sample map

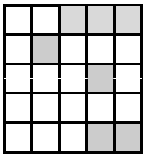
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

9. Appendix 2: Visualizations of hints

1. A list of random tiles that doesn't contain the treasure (1 to 12)
2. A list of random tiles that contain the treasure (5 - 20) (rare)







3. 2-5 regions that 1 of them has the treasure

0	0	4	4	4
0	1T	4M	4	4
1	1M	3M	3	5
2	1	1	3	5
2	2	0	3	5

0	0	4	4	4
0	1T	4M	4	4
1	1M	3M	3	5
2	1	1	3	5
2	2	0	3	5

4. 1-3 regions that do not contain the treasure

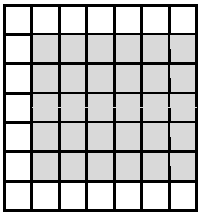
0	0	4	4	4
0	1T	4M	4	4
1	1M	3M	3	5
2	1	1	3	5
2	2	0	3	5

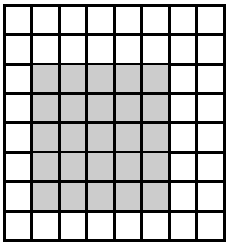
0	0	4	4	4
0	1T	4M	4	4
1	1M	3M	3	5
2	1	1	3	5
2	2	0	3	5

0	0	4	4	4
0	1T	4M	4	4
1	1M	3M	3	5
2	1	1	3	5
2	2	0	3	5

5. A large rectangle area that has the treasure

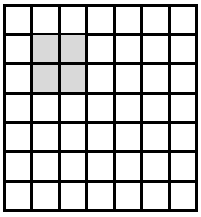
0	0	4	4	4
0	1T	4M	4	4
1	1M	3M	3	5
2	1	1	3	5
2	2	0	3	5

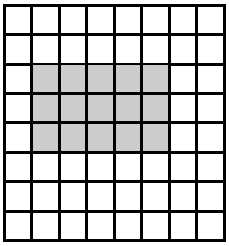




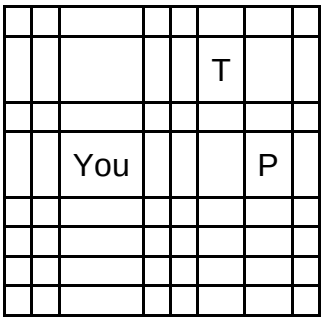
6. A small rectangle area that doesn't has the treasure

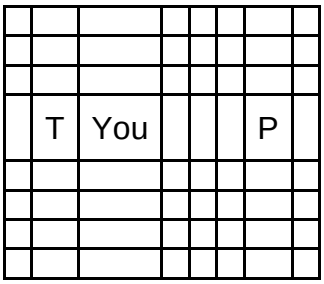
0	0	4	4	4
0	1T	4M	4	4
1	1M	3M	3	5
2	1	1	3	5
2	2	0	3	5



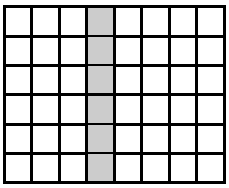


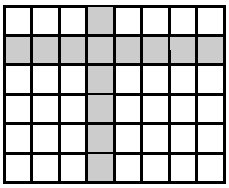
7. He tells you that you are the nearest person to the treasure (between you and the prison he is staying)

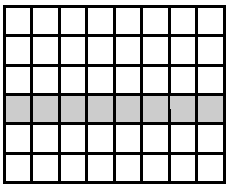


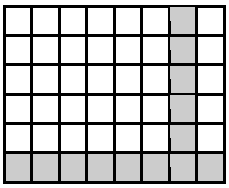


8. A column and/or a row that contain the treasure (rare)
9. A column and/or a row that do not contain the treasure









10. 2 regions that the treasure is somewhere in their boundary

0	0	4	4	4
0	1T	4M	4	4
1	1M	3M	3	5
2	1	1	3	5
2	2	0	3	5

0	0	4	4	4
0	1T	4M	4	4
1	1M	3M	3	5
2	1	1	3	5
2	2	0	3	5

0	0	4	4	4
0	1T	4M	4	4
1	1M	3M	3	5
2	1	1	3	5
2	2	0	3	5

11. The treasure is somewhere in a boundary of 2 regions

	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

12. The treasure is somewhere in an area bounded by 1-3 tiles from sea

	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

13. A random half of the map has no treasure (rare)

	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

14. From the center of the map/from the prison that he's staying, he tells you a direction that has the treasure (W, E, N, S or SE, SW, NE, NW) (The shape of area when the hints is either W, E, N or S is triangle)

	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

15. 2 squares that are different in size, the small one is placed inside the bigger one, the treasure is somewhere inside the gap between 2 squares. (rare)

	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

16. The treasure is in regions that has mountain

	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	2	2	2	2	2	2	2	0	0	0
2	0	1	1	1	1	1	2	2	2M	2M	2M	2	2	0	0	0
3	0	1	1	1	1	1	2	2	2	2	2M	2	2	3	3	0
4	0	0	1	1	1M	1	2	2	2	2	2	2	2	3	3	0
5	0	0	0	5	5M	5M	2	2	2	2P	2	2	2	3	3	0
6	0	0	0	5	4	4M	4	4	4	4	3	3	3	3	3	0
7	0	0	5	5	4	4	4	4	4	4	3T	3	3	**3P**	3	0
8	0	5	5	5	4	4	4	4	4	4	3	3	3	3	3	0
9	0	5	5	5	4M	4M	4	4	4	4M	3	3	3	6	6	0
10	0	5	5	5	4	4M	4M	4M	4M	4	3	3	3	6	6	0
11	0	5	5	**5P**	5	5	0	4	4	4	3	3	3	6	6	0
12	0	5	5	5	5	5	0	6	6	6	6	6	6	6	6	0
13	0	5	5	5	5	5	0	6	6	6	6	**6P**	6	6	6	0
14	0	0	0	5	5	5	0	6	6	6	6	6	6	6	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

END.